

INFORMATION CIRCULAR
DEPARTMENT OF COMMERCE - BUREAU OF MINES

GEOPHYSICAL ABSTRACTS
NO. 1



BY
FREDERICK W. LEE

This paper is the first of a contemplated series which will contain abstracts of current articles and publications dealing with applied geophysics. The abstracts will be prepared, for the most part, by officials and engineers of mining and exploration companies, in cooperation with the United States Bureau of Mines. It is believed that useful and timely information dealing with the science of applied geophysics can thus be adequately presented. The Bureau plans, if possible, to procure the original papers from which these abstracts are prepared and to assist those who may be interested in obtaining translations or photostat copies.

A handwritten signature in cursive script, reading "Scott Turner". The signature is written in dark ink and is centered on the page.

SCOTT TURNER,
Director.

INFORMATION CIRCULAR

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No. 1

Compiled by Frederick W. Lee²

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1 - GRAVITATIONAL METHODS.

WIRELESS CONTROL OF COINCIDENCE OUTFIT FOR RELATIVE GRAVITY MEASUREMENTS

By Berger and Brückner

Zeitschrift fuer Instrumentenkunde, vol. 48, 1928, p. 366

A detailed description is given of radio apparatus for controlling a coincidence outfit for relative gravity measurements. This is probably of little interest, since many types of apparatus could be used. The general method employed is the interesting thing about this paper. As long ago as 1883 von Sterneck made a proposal to control two coincidence boxes with the same clock, and many persons have suggested the use of radio for this purpose. In accomplishing this it would appear to the reviewer that this method is probably inferior to that used by the Marland Oil Co., but Berger and Brückner must be given the credit for important advances in the coincidence method. In their apparatus a clock at a central station actuates a relay, which operates a short-wave transmitter (40 m.). At the receiving station the amplification is accomplished at low frequencies. The signal operates a relay which moves a slitted screen in a coincidence apparatus. This screen has been improved considerably, to decrease the mean error in observing a coincidence. As usual, a telescope is used to observe the flashes of light. It has a scale in its focal plane and positions of successive flashes are easily read off and recorded by a second observer. This makes possible a higher accuracy in determining the exact instant at which coincidence would have occurred at the zero point on this scale.

This method obviously depends on the constance of the mechanical and electrical lag in both sending and receiving apparatus, and may be adversely criticized from this standpoint. -- A. E. Ruark.

GRAPHIC METHODS FOR CORRECTION OF GRAVITATIONAL OBSERVATIONS WITH RESPECT TO TOPOGRAPHY, AS WELL AS WITH RESPECT TO THE SUBTERRANEAN MASSES

By B. V. Numerov

Bulletin of the Geological Committee, appendix to vol 44,
No. 1, Leningrad, 1925.

Deducing briefly the formulas for the establishment of corrections of observations in connection with the topographic influence as proposed by Hayford and others, the author explains the difficulties of determination of the "gravitational anomalies" by this method and proposes to solve this problem, to great advantage, by using a map provided with contour lines, as such a solution may be attained in a geometrical way.

The solution of the problem of the influence of subterranean masses by a geometrical method is explained by the author also. -- W. Ayvazoglou.

THEORETICAL CASES FOR THE USE OF GRAVITATIONAL (GRAVIMETRIC) METHODS IN GEOLOGY

By B. V. Numerov

Bulletin of the Geological Committee, vol. 44, No. 3,
Leningrad, 1925.

The author examines the problem of applying gravitational (gravimetric) methods in the study of geological formations of superstrata.

According to the author this problem may be approached by examining special examples of forms of underground strata and by calculating their influence on the gradients and on the gravity.

The following forms are examined in the article: that of a finite parallelopiped, an infinite vertical parallelopiped, and oblique rectangular prism and an oblique triangular prism.

The article gives formulas by which the sensibility of variometers and pendulums for the case of an infinite horizontal stratum may be compared.

The influence of such a stratum on the gradients, measured by a variometer, depends on the relation of the depths, while the gravity is characterized by the thickness of the stratum.

Based on the formulas, a series of tables is prepared with the aid of which the character of the changes of the gradients for any infinite prism of any position with regard to the horizontal plane may be calculated easily. --
W. Ayvazoglou.

THE INTERPRETATION OF GRAVITATIONAL OBSERVATIONS

By B. Numerov

Bulletin of the Institute of Astronomy, No. 15, Leningrad, Feb. 15, 1927

Three methods for the construction of a gravitation curve of an infinite prism of any section are examined in the article. The first method is a graphic one and consists of counting the number of sectors included within a given section. The second method is based on calculations. In the third method a special instrument, a kind of planimeter, is used.

The reciprocal problem of the interpretation of the observed gravitational curve is proposed to be solved by the method of successive approximations. --
W. Ayvazoglou.

CORRECTION OF OBSERVATIONS MADE BY MEANS OF A
GRAVITATIONAL VARIOMETER WITH RESPECT TO TOPOGRAPHY.

By B. Numerov

Bulletin of the Institute of Astronomy, No. 17, Leningrad, December, 1927

This paper is an exposition of an analytical and graphic method of taking topographic conditions into account when effectuating observations with the help of an Eötvös torsion balance. The integration is carried out in cylindrical coordinates. The analytical method allows the integration with respect to height to be fulfilled with the utmost accuracy; the integration with respect to the radius is carried out by means of special formulas of quadratures taking into consideration the peculiar character of the changes of the functions being integrated. The integration with respect to the angle is produced with due accuracy on the basis of the expansion of functions under the sign of the integral into Fourier's series.

The graphic method allows the determination of the effect of topographic conditions within the limits of the radius from 50 to 500 m. and over that, with the help of graphics dividing the area into sectors of equal effect. Thus the determination of the effect of the relief leads to the calculation of the area occupied by the mass lying between two adjacent horizontals. -- W. Ayvazoglou.

GRAVIMETRIC RESEARCHES OF FERRUGINOUS QUARTZITES
IN THE REGION OF KRIVROY ROG

By P. Nikiforov, S. Ghirin, A. Terentiev, and N. Veshniakov

Bulletin of the Institute of Practical Geophysics,
No. 3, Leningrad, 1927, pp. 322-385

The gravimetric prospecting described in the article was carried out in the years 1925-26.

Chapter I

In addition to the description of the work itself practical features for the organization of the work are given also. The researches took place on three plots shown on the annexed map of the region. The problems of the research were as follows:

1. Location of ferruginous quartzite beds.
2. Determination of the elements of the deposit (extent, angle of inclination, magnitude).
3. Separating the ore-bearing zones and contouring the lenses.

4. Checking of the supposed faults.

Chapter II

Concerns the technical arrangement of the observations; gives description and preparation of the instruments and their distribution for the work.

Chapter III

Works out the data obtained by observation.

Chapter IV

Shows the calculated results by means of the following maps and graphics:

1. Topographical map with contours.
2. Curves of the horizontal gradient in the direction of the research lines.
3. Diagrams of the vectors of the entire horizontal component of the gravity force and curves of equal intensity of the force of gravity.
4. Graphics of the disturbing values of curves. -- W. Ayvazoglou.

2 - MAGNETIC METHODS

EXPERIMENTS ON THE MAGNETIZATION OF ROCKS

By F. Loewinson-Lessing and V. Mitkevich

Bulletin of the Geological Committee, vol. 44, No. 5, Leningrad, 1925

The idea of starting these experiments arose in connection with the magnetic anomaly observed in the volcanic group of Karadagh in Crimea.

Based on this anomaly the authors believed that the magnetization of these rocks is caused not by the terrestrial magnetism but by the atmospheric electrical discharges.

The well-known fact that the lightning which produces fulgurites in the rocks produces at the same time permanent magnetization could not be applied here, as there were no fulgurites in the Karadagh rocks; thus the question as to whether a permanent magnetization of the rocks from a distance is possible or not was to be solved.

A series of artificial magnetizations of the rocks by means of a straight electromagnet, with an iron rod 400 mm. in length and 50 mm. in diameter, was performed by the authors. A magnetic field of 3,500 gauss was used.

More than 200 samples of rocks and minerals were submitted to magnetometric tests before and after the experiments.

The rocks and minerals used for the experiments, as well as the results obtained, are given in a table.

They are arranged according to special groups, and the results are summarized by comparison of the data obtained.

Plutonic Rocks: 59 per cent of the samples tested did not display any natural magnetization, but 68.8 per cent of them became magnetized artificially and retained the magnetization permanently. Most granites were free from natural magnetization but were susceptible to artificial magnetization.

Effusive Rocks: All effusive rocks, even those magnetized by natural magnetization, may be magnetized artificially.

Contact-Metamorphic Rocks: Of the rock in the contact-metamorphic group 55.5 per cent are free of natural magnetization, but in most cases they can be magnetized sufficiently strongly.

Metamorphic Rocks: Of the metamorphic rocks 61 per cent did not show any magnetization; an intense artificial magnetization was attained for rocks with weak magnetization.

Sedimentary Rocks: Rocks classed as sedimentary are mostly free of magnetization and, in general, can not be magnetized.

Based on the experiments, the authors drew the conclusion that the permanent magnetization displayed by the rocks must in some cases be attributed to the discharges of lightning and not to terrestrial magnetism. The question as to whether there are means to distinguish the magnetization of the rocks produced by the terrestrial field from that produced by lightning was raised. The authors answer this question in the affirmative and believe that they have found the method by which the residual magnetism produced by the lightning can be determined. At the same time they express the desire that their method be applied in the study of the permanent magnetization of rocks. — W. Ayvazoglou.

THE COMPASS DIAL WITH OSCILLATING NEEDLES (The Inclined Compass Dial)

By V. Pavlinov

Bulletin of the Geological Committee, appendix to vol. 46,
No. 7, Leningrad, 1927

The article gives a detailed description of the compass dial with oscillating needles used at the present time in prospecting.

The author explains the rules necessary for taking care of the dial and insists on the necessity of studying them, as even the smallest damage to the dial, which usually can not be repaired by emergency means, makes the dial useless, thus increasing the obstacles for prospecting.

THEORIE UND PRAXIS DER MAGNETISCHEN SCHUERTMETHODEN

By Johann B. Ostermaier

Internationale Zeitschrift fuer Bohrtechnik, Erdoelbergbau und Geologie, vol. 37, No. 1, 1929, pp. 1-3

This article is a continuation of a series started in 1927, Nos. 10, 11, 13, and 14. The author describes the construction and properties of the Kohlrausch variometer and the Bidlingmaier double compass. Interesting is the determination of temperature variations by means of thermometers of the same caloric capacity as the magnetic system or, in other words, by means of thermometers the variations of which do not lead or lag compared with the temperature variations of the magnet system. This is accomplished by using thermometers of different dimensions. Small thermometers are leading, while large thermometers are lagging in regard to the temperature variations of the magnet system. -- T. Zuschlag.

THE INFLUENCE OF TOPOGRAPHY ON THE EARTH MAGNETIC VERTICAL FIELD

By J. Koenigsberger

Sonderdruck aus Gerlands Beiträge zur Geophysik, vol. 20, No. 3/4, 1928.
Akademische Verlagsgesellschaft m. b. h., Leipzig.

The unevenness of the terrain causes a topographic effect on the magnetic vertical intensity Z , which is difficult to deduce theoretically. An extremal positive and negative value for ΔZ (the additional vertical intensity) for a certain susceptibility, K , apparently is $\Delta Z = \pm 4\pi KZ$. This effect for $K \leq 0.01$ is almost proportional to K . The largest difference between summits (+) and steep valleys (-) observed in mountains of gneissic rocks (Bellinzona, Ticino, Switzerland) was about 120 γ . The vertical intensity in the immediate neighborhood of the wall of the quarry was about -40 γ . In case of a very small K , the effect observed was equal to zero. Thus, the effect depends on the angle of the slope and should depend on the situation of the wall to the magnetic meridian; but this latter dependence could not be observed. Therefore, by the topographic effect the value of the susceptibility of large masses of rock in the earth magnetic field can be calculated approximately. The observations were made with a vertical variometer which gives an accuracy of about $\pm 3 \gamma$ for the results. The local inhomogeneity of the places where the topographic effect was studied was about $\pm 4 \gamma$. -- W. Ayvazoglou.

INTERPRETATION OF CHARTS OF MAGNETIC ISANOMAL CURVES
AND PROFILES (WITH 9 FIGURES).

By J. Koenigsberger

Sonderdruck aus Gerlands Beiträge zur Geophysik, vol. 19, No. 2, 1928.
Akademische Verlagsgesellschaft m. b. h. Leipzig.

The isanomal curves for the vertical and horizontal intensity and for the inclination with respect to the surface of the earth, based on the exact theory of induction, are given by formulas and figures for a sphere and for an oblate ellipsoid of revolution; it is also shown how the depth of their centers under the surface of the earth can be calculated. The formulas are given for the isanomal curves of the vertical component which are caused by an elongated ellipsoid of revolution with vertical axis and an oblate ellipsoid of revolution in different positions. The characteristic parameters can be found in tables with the aid of which - and by interpolation, also, for some curves - the center depth and, in case of comparatively small depth, the form and position of the ellipsoid also can be found.

The conclusions drawn from magnetic charts of vertical intensity anomalies are as follows: The magnetic anomalies show the depths of the center of the disturbing mass from the surface to be between 0.2 to 20 km.; comparatively often depths of from 3 to 6 km. were found. Conducting channels of masses belonging to effusive rocks on the surface have a depth of from 3 to 6 km.; their continuation down to the plastic zone is dipping under gentle angles. The higher zone, partially of effusive type, of these basic rocks has a depth of center from 300 to 1000 m., and the same is approximately true for some so-called plutonic rocks, which therefore do not always continue in great depths. The great anomalies marked on maps with scale of 1:1,000,000 or more have very varying depths of center of from 0.3 to 30 km. -- W. Ayvazoglou.

APPARATUS FOR CALIBRATION OF MAGNETOMETERS

By W. Pavlinoff

Bulletin of the Institute of Practical Geophysics of the Supreme Council
of Public Economy, No. 2, Leningrad, 1926, pp. 177-183

This paper deals with the task of constructing an instrument capable of producing easily and with precision a homogeneous horizontal and vertical magnetic field of a desired intensity within the bounds of a sphere 30 cm. in diameter.

The apparatus constructed by the author represents a system of two magnetic shells in Helmholtz's arrangement.

The diameter of the instrument is about 7 feet and the number of windings in both coils together is 158.

The instrument can be placed so that its axis coincides with the vertical line, or the axis can be placed horizontally in every azimuth. The electric current is measured by Weston's amperemeter of high sensitivity. Any magnetometer can be examined by this instrument and its curves can be constructed. The characteristic curves of the Tiberg-Thalen and Thomson-Thalen magnetometers are given in the appendix to the article. -- W. Ayvazoglou.

THE MAGNETIC FIELD OF BODIES OF REGULAR SHAPE FROM THE VIEWPOINT OF MAGNETOMETRIC STUDIES

By J. Bahurin

Bulletin of the Institute of Practical Geophysics, No.2, Leningrad, 1926, pp.1-63
Bulletin of the Institute of Practical Geophysics, No.3, Leningrad, 1927, pp.148-255

In Chapter I the author examines the magnetic field of an oblate ellipsoid of revolution magnetized in the direction of its axis of revolution. Diagrams showing the vectors of total intensity and the lines of equal values of horizontal and vertical intensities produced by the ellipsoid, as well as tables for the calculation of the data of vertical and horizontal intensities for any ellipsoid of revolution, are given.

Chapter II considers the magnetic field of an infinitely long elliptical cylinder. The situation of the characteristic points of the field and their relation to the dimensions and to the depth of the ore body are established by detailed mathematical analysis.

The article is completed by many tables and diagrams.-- W. Ayvazoglou.

MAGNETIC PROSPECTING IN THE IRON ORE REGION OF THE PROVINCE OF TULA

By N. Rose

Bulletin of the Institute of Practical Geophysics, No.3, Leningrad, 1927, pp.137-147

The object of the magnetic work carried out by the author consisted of establishing the influence of the deposits of weak magnetic limonite on a magnetic field at the surface; the thickness of the horizontal ore layers of the region is about 36 m. and the depth is from 21 to 27.6 meters. The magnetic surveying was carried out by means of Moureaux-Chasselon's magnetic theodolite and Dover's needle indicator.

Two courses of 16 points each with an average distance between them of about 640 m. were made. Deviations from the normal values of the magnetic elements in the point of intersection of the ore fields by the course are given in tables and diagrams. -- W. Ayvazoglou.

3 - SEISMIC METHODS

THE SEISMOGRAPH IN THE GULF COAST

By Mark C. Malamphy

The Oil Weekly, Jan. 18, 1929, pp. 31-34

A brief review of the history of seismographic exploration in Texas is followed by an elementary description of the fundamental ideas involved in the method, the principles on which the different types of seismographs are based, and a statement of the main physical facts which determine the velocity and path of an explosion wave through the ground. This is followed by an outline of the method of working and of interpreting the results, illustrated by a diagram and graphs of the time-distance curve. These graphs are entirely imaginary and represent what the writer thinks should happen under the assumed conditions according to the still popular "Mintrop theory;" no other method of interpretation is mentioned, so that the reader is left to infer that these ideas are universally accepted. The last half of the article is devoted to a description of field methods, as used for the finding of "salt domes," the organization of field parties, estimates of cost of such exploration, difficulties of operation, and many practical details which should be very valuable to any company contemplating such work. -- Kenneth Hartley.

4 - ELECTRICAL METHODS

CONCERNING SOME PHENOMENA OBSERVED DURING THE ELECTRICAL METHOD OF PROSPECTING

By F. Shkliarevsky

Bulletin of the Geological Committee, appendix to vol.44,
No. 2, Leningrad, 1925.

This article describes prospecting by the electrical method, in particular the method of equipotential lines, using the linear electrodes.

Copper pyrites and the sericite schists deposited in greenstone ores were prospected. The author gives explanation of some phenomena by which the conditions of work were made difficult; he mentions especially the fact that an absolute damping of the sound in the telephone of the feeding circuit could not be obtained. According to his opinion the main reasons for this were:

1. The damping was prevented by the induction of circuits in the neighborhood of the electrodes and of the feeder connecting the generator with the electrodes.

2. A phase displacement caused by self-induction.
3. The inductional humming produced in the neighborhood of the pyrites.

The author concludes that there were other phenomena observed during the electrical prospecting which could not be explained satisfactorily by him, thus the cooperation of expert electrophysicists for solving these phenomena is very desirable. -- W. Ayvazoglou.

RADIO IN ORE PROSPECTING

By A. Petrowsky

Bulletin of the Institute of Practical Geophysics, No.1, Leningrad, 1925, pp.135-151

Contents of the article:

1. First tests with radio for prospecting purposes (Trustedt, Lowery and Leimbach).
2. The shade or absorption method.
3. The beam or reflection method.
4. The interference or superposition method.
5. The return method or quarter-wave.
6. The wave measuring method.
7. The measuring of short waves.
8. The present state of these methods.

The methods are illustrated by plans showing the cross sections of the terrain. -- W. Ayvazoglou.

ELECTRIC CONDUCTIVITY OF ORES AND ROCKS

By D. Murashov, E. Berengarten, A. Etcheistova and L. Khudiakova

Geological Committee. Series of applied Geophysics and Prospecting. No. 1, Leningrad, 1928.

The present paper contains the summarized results of a series of measurements of the electric conductivity of various ores and rocks from a number of deposits, in respect to which the question has arisen, or may arise, as to the applicability to them of the methods of electrical prospecting.

Methods of measurement are described. The results obtained from the investigation of the specific resistance of 180 samples, as well as the mineralogic and petrographic composition of the latter, are shown in the appended tables.

The samples characterize various deposits of the Ural, Caucasus, South Russia, Kazakstan, Altai, and Central Siberia.

Fully amenable to the successful application of methods of electric surveying are various more or less continuous pyritic copper and polymetallic ores with prevalence of pyrite, chalcopyrite, bornite, chalcocite, galenite, and arsenopyrite, enclosed in metamorphic schists, limestones, and other rocks.
-- W. Ayvazoglou.

ERDOEL IN MECKLENBURG-SCHWERIN (GERMANY)

By

Internationale Zeitschrift fuer Bohrtechnik, Erdoelbergbau, und
Geologie, vol. 37, No. 2, 1929, p. 16

The Luebthen-Jessenitz dome was investigated by seismic and electric methods after a dry hole northeast of the dome had been abandoned at a depth of 650 m. According to the electric investigations of Piepmeyer and Co., oil should be expected at 1,000 to 1,200 m. depth on the northwestern part of the dome. The Mecklenburg Landtag has provided the money for the drilling operations to check up this prediction. Near the village of Oberg five producers of 10 to 30 tons per day were brought in at a depth of 510 to 550 m. -- T. Zuschlag.

OIL IN MECKLENBURG-SCHWERIN

By H. Rantenkranz, Celle.

The salt dome of Luebthen-Jessenitz has been known for several decades already.

In 1927 a drill for oil was abandoned because at a depth of 650 m. there was still found younger Tertiary. With seismographs and electric methods the Northeast and Northwest boundaries of the salt dome have now been accurately determined, and a new drill has been decided. According to the electric indication the oil would occur at a depth of 1,000 to 2,000 m. Another occurrence of oil has been lately discovered near Oberg. Five drills have reached the oil horizon at a depth of 510 to 550 m. and yield a daily production of 10 to 30 tons. The thickness of 10 to 15 m. of the oil horizon seems to promise a continuous production. -- W. P. Jenny.

ELECTROMETRIC METHODS IN ORE PROSPECTING AND EXPERIMENTAL
INVESTIGATIONS AT RIDDER'S MINE DURING THE SUMMER OF 1924

By A. Petrowsky

Bulletin of the Institute of Practical Geophysics, No.1, Leningrad, 1925, pp.107-132

The author describes the results of the detailed investigations made at Ridder's Mine (Altai). The method of the measurement of the natural direct currents, as well as that of the measurement of the artificial direct currents (Kelly's method), with a few modifications introduced by the author, were used. The modifications concern the method of moving the electrodes and of adding resistance. Petrowsky's method of introducing the current into the earth by means of a great number of small electrodes placed along the boundary of the investigated field and connected with each other by wire on a state of equal potential (called by him the "Dot system of arranging electrodes") takes rank between Schlumberg's and Lundberg's methods. According to the author it was used with great advantage.

The article is illustrated by pictures and diagrams. — W. Ayvazoglou.

NATURAL ELECTRIC FIELD PRODUCED BY ORE

By A. Petrowsky

Bulletin of the Institute of Practical Geophysics, No.1, Leningrad, 1925, pp.87-104

The following questions are examined in the article:

1. The natural circumstances and conditions by which a natural electric field is produced by ore.
2. The basis of the theoretical examination of this question.
3. Differential equations and limitations in the case of an infinite medium.
4. The expression for the electric potential and potential gradient in this case.
5. A polarized sphere in a medium limited on one side by a plane.
6. The final equation of the electric potential and the potential gradient.
7. The transformation of the formulas.
8. The examination of an electric field along a plane of polarization created by an ore body.
9. The examination of an electric field along a plane perpendicular to the plane of polarization.

The article is provided with the following diagrams:

1. The electric currents produced by the ore body.
2. Vertical and horizontal sections of a polarized sphere.

3. Electric field produced by the polarized field.
4. Polarized sphere and its electrical representation.
5. Distribution of the electric power along the axis of the abscissas.
6. Distribution of the electric power along the axis of the ordinates.--

W. Ayvazoglou.

DETERMINATION OF THE LOCATION, DEPTH AND THICKNESS OF A SPHERICAL
ORE BODY BY OBSERVING THE EARTH CURRENT PRODUCED

By A. Petrowsky

Bulletin of the Institute of Practical Geophysics, No.3, Leningrad, 1927, pp.3-36.

Contents:

Chapter I

1. The problem and the formulas obtained by its analysis.
2. The general nature of the electric profile in the plane of polarization.
3. The zero curves.
4. The maximum curves.
5. The general nature of an electro-profile which is obtained in a plane perpendicular to the plane of polarization.
6. The zero curves.
7. The maximum curves.

Chapter II

1. The determination of the location, depth, and thickness of a spheric ore body.
2. Graphic calculation.
3. Analytic calculation.
4. Graphic interpretation.

Chapter III

1. The formulas which express the gradients of the potential along a line that is inclined to the plane of polarization.
2. The general nature of an electrophile in a plane that is inclined to the plane of polarization.
3. The zero curves.
4. The maximum curves.
5. The full scheme of the observation and calculation of the elements that characterize the spheric body.

The article is illustrated by many diagrams.--W. Ayvazoglou.

CALCULATIONS OF AN ARTIFICIAL ELECTRIC FIELD

By A. Petrowsky

Bulletin of the Institute of Practical Geophysics, No.3, Leningrad, 1927, pp.39-63.

Contents of the article:

1. The relation between the charge and strength of the current in a three-dimensional system.
2. The Schlumberger field.
3. The Petrowsky field.
4. The Lundberg field.
5. The equipotential lines and current lines of the field.
6. Procedure of the calculation of potential values.
7. Application of the special tables.
8. Procedure of the calculation of equipotential lines.
9. Procedure of the calculation of potential gradient.

The procedures of the calculations of (6) and (9) as well as the application of special tables (7), are given in the form of examples. — W. Ayvazoglou.

THEORY OF THE MEASUREMENTS OF EARTH CURRENTS

By A. Petrowsky

Bulletin of the Institute of Practical Geophysics, No.1, Leningrad, 1925, pp.73-87.

Contents:

1. The problem (what appearance have equipotential surfaces and lines of force when conducting into the earth a receiving electrode of spheric shape?).
2. Differential equations and limitations of the influence of an electrode in an unlimited space.
3. A general integral for an E-potential.
4. The meaning of the arbitrary constant.
5. The influence of a flat limited surface upon the E-potential.
6. The meaning of the E-potential in this case.
7. The potential of a spheric electrode half buried in the ground.
8. The distribution of the equipotential surfaces and of the current lines with different conditions.

By the aid of the formulas calculated, a series of graphs showing the electric field near an electrode is calculated and drawn. — W. Ayvazoglou.

ELECTROMETRIC INVESTIGATION OF THE UPPER-ARSHINSK
(URAL) ORE BED, ACCOMPLISHED IN SUMMER OF 1926.

By A. Petrowsky, R. Skariatin, and L. Kleiman

Bulletin of the Institute of Practical Geophysics, No.3, Leningrad, 1927, pp.64-86.

The chief problem consisted in stating to what extent the results expected from the electric method of investigation may agree with the results of an ordinary prospecting.

The work consisted of:

1. Surveying of isolines by means of an alternating current.
2. Surveying of gradients by means of direct current.
3. Supplementary measurements, such as the resistance of the ground in different parts of the field, distribution of the intensity along the conducting line of the electrode, and voltage drop on principal and auxiliary lines.

A benzine motor coupled with an alternator of high frequency and a direct current dynamo were used as a generating set. The results of the electric investigation were considered favorable, as the data obtained agreed with those procured by direct digging. -- W. Ayvazoglou.

THEORY OF THE RETURN METHOD

By A. Petrowsky

Bulletin of the Institute of Practical Geophysics, No.2, Leningrad, 1926, pp.143-173

Contents:

1. The nature of the return method.
2. The conception of an electromagnetic representation.
3. The conditions to which an electromagnetic field should conform.
4. The values of the component of the electromagnetic force, at any point of a field, which is created by an antenna and its electromagnetic field on a level surface.
5. The total electric and magnetic force at any point of the field.
6. The values for the component of the electric and magnetic forces and of their image on a level surface, if the forces are created by the dipole of Hertz.
7. The influence of the returning wave upon the dipole.
8. The transposition of the obtained formulas.
9. The examination of the dependence of the reaction upon the dipole from the inclination of the reflecting surface.
10. The calculation and graphic construction of the auxiliary values γ and γ_3 that enter the coefficients of the reaction curves.

11. The calculation and graphic construction of the coefficient themselves.
12. Supplementary constructions.
13. Calculation and graphic construction of a complete reaction curve for a dipole.
14. Reaction curve for an ideal dipole.
15. Reaction curve for a dipole that has some leakage.
16. Reaction curve for a symmetric and straight conductor.
17. Reaction curves for small coils. -- W. Ayvazoglou.

5. - RADIOACTIVE METHODS

ON THE THEORY OF AN ASPIRATOR DEVICE FOR THE INVESTIGATION OF ORE SAMPLES WITH REGARD TO THEIR RADIO ACTIVITY

By V. J. Baranov

Bulletin of Geological Committee, appendix to vol. 44,
No. 4, Leningrad, 1925.

The theory of the device, based on the natural ionization of radioactive bodies is proved by experiments.

A diagram shows curves obtained by theoretical calculations as well as those obtained by experiments.

In addition to the direct purpose, that is of the investigation of radioactivity of ore samples for which the device is constructed, the device may, according to the opinion of the author, be used also for preliminary comparison of the radioactivity of rocks instead of the Elster and Gietel method. -- W. Ayvazoglou.

APPLICATION OF EBERT'S ION-METER FOR A RAPID DETERMINATION OF THE RADIO- ACTIVITY OF THE SAMPLES ON THE SPOT

By V. J. Baranov

Bulletin of the Geological Committee, appendix to vol. 46,
No. 1, Leningrad, 1927.

The author proposes to provide the groups assigned for the research of radioactive deposits with Ebert's ion-meter owing to the importance of the investigation of the ionization of the air in the region of the research work and to the possibility of a rapid determination on the terrain itself of the radioactivity of the samples collected.

A full description of the instrument and its operation is given in the article. -- W. Ayvazoglou.

ASPIRATOR FOR INVESTIGATION OF RADIOACTIVITY
OF THE SAMPLES OF ORES IN GEOLOGICAL COLLECTIONS

By A. P. Kirikov

Bulleting of Geological Committee, appendix to vol. 44,
No. 1, Leningrad, 1925.

The idea of the device is based on Ebert's principle which consists of counting the ions by catching them on a charged electrode placed in a tube through which a fixed volume of air passes. Data characterizing the work of the device are given in a table, and the operation of performing measurements is explained. The device may be used with great advantage for establishing deposits of radioactive ores by testing samples of existing collections. The determination of a relative radioactivity of ores in a box with about 40 samples requires from one to two minutes only. Experiments performed with the aid of the new device were very satisfactory. The apparatus is intended only for investigation of samples and not for a field device. -- W. Ayvazoglou.

6 - GEO THERMAL METHODS

THE CALCULATION OF THE INFLUENCE OF ROCKS ON THE NATURAL
AND ARTIFICIAL HOMOGENOUS FIELDS IN THE GROUND

(Problems of Geothermics, Earth Magnetism,
and Geoelectrics)

By J. Koenigsberger

Sonderdruck aus Gerlands Beiträge zur Geophysik, vol. 18,
No. $\frac{1}{2}$, 1927. Akademische Verlagsgesellschaft m. b. h. Leipzig.

In addition to the statements made by Maxwell, the author shows us how the mathematical expressions, calculated for the influence of rocks (spheres and ellipsoids of rotation) on a primary homogeneous field of geothermics, earth magnetism, and geoelectrics, can be derived by taking into consideration their borders on the earth surface. The application of general theorems is examined in a special case, that of the deviation of geoelectric current lines on the surface of the earth (Schlumberger's probe method) caused by a sphere and oblate ellipsoid of rotation in the ground. The probe method is compared briefly with the integral method or methods in which all factors enter, and some practical conclusions are derived. -- W. Ayvazoglou.

INTERNAL HEAT OF EARTH IS STUDIED TO ASCERTAIN FACTS ON WHICH TO BASE GEOLOGICAL PRINCIPLES

By C. E. Van Orstrand, Geophysicist, Geological Survey

The United States Daily, Washington, D. C., Feb. 15, 1929.

The question of the internal heat of the earth has been studied almost from the time of the establishment of the U. S. Geological Survey in 1879. In 1920 a report on geothermal data, based generally on the observations made by placing a thermometer in the water flowing from the mouth of a well, was published by N. H. Darton. In this report it was noted that in certain areas in eastern South Dakota the rates at which the temperatures increase from the surface downward vary somewhat uniformly from about 1° F. in 20 feet to approximately 1° F. in 45 feet. But this method of making temperature tests has proved to be not satisfactory, thus the author of this article undertook the task of designing and constructing the apparatus necessary for more accurate measurements. Two different types were developed, one of which was based on the electric resistance thermometer, and the other on the mercury thermometer of the maximum type. It has been necessary to abandon the electric method for the present, owing to the fact that the cable that will meet the requirement of withstanding the dissolving action of oil and salt water must be of relatively large diameter, possibly one-half or three-fourths of an inch; it becomes of such weight and proportions that it can not be manipulated in a deep well without the aid of powerful machinery.

The machine which is being used to-day for lowering mercury thermometers into a well by means of a piano wire consists of a steel frame and reel, a standardized wheel for accurately measuring depths, and a cylindrical cam which distributes the wire on the reel and thus prevents the transmission of impacts to the thermometers as a result of the slipping of the coils of wire on the reel. No power, other than hand power, is needed. It is a remarkable fact that a machine weighing 58 pounds, exclusive of the piano wire, which weighs 2.7 pounds per 1,000 feet, can be used to sound wells to depths of more than 4,500 feet.

Concerning the question of the value of temperature tests the scientists were not yet able to give a definite answer.

It has been assumed ordinarily that during the millions of years of the earth's existence its outer layers have gradually cooled to depths of about 200 miles. In contrast to this hypothesis is the comparatively recent supposition that practically all of the heat of the earth is due to the disintegration of radium. There are at present wide differences of opinion with regard to the causes of the irregular distributions of heat in the outer layers of the earth's crust. Thus, it has long been known that the temperatures at the same depths in different localities are not the same. For example, at Fairmont, West Va., a temperature of 170° F. was found at a depth of 7,500 feet; while at Longmont, Colo., a temperature of 212° F. exists at a depth of only 6,600 feet. In general the rates at which the temperatures increase with the depth vary from the extremely rapid rate of 1° F. in 20 feet (the value found in some of the oil

fields in Wyoming) to 1° F. in 200 feet (gold mines at Johannesburg, South Africa). No serious attempts have been made to explain these variations in the temperature of the rocks at the same depths until the U. S. Geological Survey found in some oil fields in Wyoming and California that the temperatures of the rocks at given depths were higher than the temperatures found at the same depths in the rocks immediately surrounding the fields.

The peculiar distribution of heat existing in these oil domes is attributed to the radioactivity, or, possibly, to the chemical reactions within the oil itself. Other investigators sought the explanation in deepseated intrusive masses, conduction of heat in the rocks, and the migration of waters in deeply buried sands. It is impossible at present to render a final decision as to the merits of all these hypotheses.

Most intensive investigations are conducted to-day in the United States, as a result of cooperation of various organizations, and the author believes that a precise geothermal survey will ultimately provide the facts on which certain fundamental principles of geology may be established. -- F. W. Lee.

7 - UNCLASSIFIED METHODS

GEOPHYSICAL METHODS USED FOR PROSPECTING OF ORE DEPOSITS

By A. K. Gedovius

Bulletin of the Geological Committee, vol. 44,
No. 1, Leningrad, 1925.

After giving a brief description of the fundamental purpose of applied geophysics, the author enumerates the geophysical methods used for prospecting of ore deposits. He divides the methods into two groups, according to the physical properties of ore bodies.

In the first group he includes those methods characterized by a direct manifestation of the ore bodies at a certain distance (magnetic method, gravitational method, and radioactive method).

In the second group are the methods by which he examines the physical properties of ore bodies which, although not manifested at a distance, influence the distribution of the electric energy sent into the ground by artificial means (methods based on electric conductivity and dielectrical constant, and the seismic method).

A brief historical review of the development of the methods, as well as a few examples illustrated by diagrams, is given. -- W. Ayvazoglou.

8 - GEOLOGY

NEUE ERDOELVORKOMMEN IN BULGARIEN

By

Internationale Zeitschrift fuer Bohrtechnik, Erdoelbergbau und
Geologie, vol. 37, No. 1, 1929, pp. 7.

Indications of oil were found near Tschirpan, Rupki, and Swoboda. Professor Bontschew, Bulgarian geologist, has been asked by the Bulgarian Government to make investigations. -- T. Zuschlag.

ERDGAS BEI SISAK, SHS

By Dr. Lupas Waagen

Internationale Zeitschrift fuer Bohrtechnik, Erdoelbergbau und
Geologie, vol. 37, No. 2, 1929, pp. 9-10

The newspaper report that oil was found near Sisak is not true. However, gas was struck while drilling water wells. The author discusses the geology and general structure of the Sisak plain, as well as the special conditions under which the gas was found. -- T. Zuschlag.

DAS ERDOELGEBIET DER HALBINSEL SANTA ELENA (ECUADOR)

By

Internationale Zeitschrift fuer Bohrtechnik, Erdoelbergbau und
Geologie, vol. 37, No. 1, 1929, pp. 4-5

The article is an abstract of a geological report by Cunningham Craig. The general geology, structure, the known resources and the methods of production are discussed briefly. -- T. Zuschlag.

DIE ERSTEN ERFOLGREICHEN ERDOELBOHRUNGEN IN BRASILIEN

By

Internationale Zeitschrift fuer Bohrtechnik, Erdoelbergbau und
Geologie, vol. 37, No. 3, 1929, p. 22

The Brazilian Ministry of Agriculture announces that the first important wells in Brazil were brought in near Botocatu and Piracicaba in the State of Sao Paulo. Chief Engineer Schermuly investigated several locations in the States of Parana and Sao Paulo by means of his patent Polarisator. His predictions were proved on the Fazendas Parro Branco and Maria Isabella near the Rio Iguassu, as

well as on Fazenda Araqua near Piracicaba. On Fazenda Saltinho near Botocatu on the Rio Tiete he predicted oil in five horizons down to 1,600 m. depth. -- T. Zuschlag.

THE DRILLING ACTIVITY AT BORYSLAW FROM 1924 TO 1928

By Dr. Alfred Pfaff, Soln, near Muenchen

Abstracts from "Petroleum" vol. 25, No. 1.

Detailed tables are given about the drilling activity of the different oil companies at Boryslaw from July 1, 1924, to July 1, 1928. The tables show that the small companies have developed a much larger percentage of drilling activity than the larger concerns, which conclusion would be in favor of a decentralization of the oil industry at Boryslaw.

From 1924 until 1928, there have been drilled at Boryslaw a total of 130.017 m.; i.e. 96,000 m. for new drills at an average cost of 570 zloty per meter, and 34.017 m. for deepenings at an average cost of 1,600 zloty per meter. The daily production in July, 1928, amounted to 148,55 cisterns from a total of 338 wells with an average depth of 1500 m.

The annual production of 54,000 cisterns has been quite constant for the last few years and corresponds to 20.3 completely drilled wells per year. The average total production of a well is therefore 2,660 cisterns, or 83.6 per cent of the total production in 1913, which amounted to 3,182 cisterns.

In order to encourage the drilling activity, and especially the deepening of old wells, a new system of taxes is proposed, which is to increase the taxes with increasing daily production of the well. -- W. P. Jenny.

Bulgaria

In the neighborhood of the town of Tschirpan in Central Bulgaria there have been found very promising indications of oil, which are being examined by Professor Bontchev of the University of Sofia. Beside the indications near Tschirpan, oil has been found under a layer of hard rock at a few meters depth near Roupki and Svoboda, both in the county of Tschirpan. Great interest has been shown in these oil deposits by foreign concerns. -- W. P. Jenny.

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